Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

A BIBLIOGRAPHY OF LITERATURE RELATING TO THE EFFECTS OF WIND ON PLANTS.

BY J. B. S. NORTON, ST. LOUIS, MO.

Read (by title) before the Academy October 29, 1897.

The following bibliography was prepared during the winter of 1896 in a study of the effects of the tornado of May 27, 1896, on trees about St. Louis, Mo., and has since been amplified. While I have not completed the original work on this subject that I have in mind, I present this list of the already published works which have come to my knowledge, believing it will be of interest and perhaps some aid to persons living in a state in whose economy wind plays so important a part. Usually little notice is taken of the influence of wind on plants or modifications brought about in them by its action, in comparison with what has been written regarding other less potent forces of nature. A study of the flora of our Western plains, where strong winds are almost constant and severe ones common, from this standpoint, would no doubt reveal many interesting points.

The effects of wind on plants may be classed under several heads:

A. Indirect, such as—
   1. Carrying moisture in the form of clouds which supply plants with water.
   2. Aiding transpiration by change of moist for dry air. The effects of hot winds might be placed here.

B. More direct effects.
   1. Injuries, such as breaking and uprooting.
   2. Adaptations for using the wind.
      a. In effecting pollination.
      b. In disseminating fruits and seeds.
   3. Adaptations protective against wind.
      a. In wood structure.
      b. In leaf structure.
      c. In habit.
      d. In location.

The following list of references does not claim to be complete. I have endeavored especially to cite those relating to mechanical injury by wind and adaptations brought about by wind action, omitting all works relating only to wind pollination and dissemination. Many accounts of tornadoes and other wind-storms in which tree destruction or injury is mentioned have been published of which only a few noteworthy ones have been given. Further search into botanical literature would no doubt reveal many other works which should have been included here, but which I have not seen. I would gladly receive information about any others. The literature relating to wind-resisting structure is very comprehensive and many other references can be obtained from the ones here given (see Tschirch and Haberlaudt.)

The work has been done in the library of the Missouri Botanical Garden.

Ammann, A. Die Pflanzenkrankheiten. Stuttgart. 1867.

Anderson, T. Report of the damages sustained by the botanical gardens in the cyclone of the 5th of October, 1864. [Calcutta.] May, 1865.

Bailey, E. H. S. Observations on a cyclone near Williamstown, Kan. Science, *22:* 3. 1893.

Belhazy, J. A szélvihar alta luczfenyvesekben elöidézett Karok egy uj neme. Erdézeti Lapok, *28:* 240–243. Budapest, 1889.

Berkeley, M. S. Anemosis. J. Lindley and T. Moore. Treasury of Botany, *1:* 65. London, 1870.

Bernhardt. Waldbeschädigungen durch Wind, Schnee, Eis, und Duftbruch. Centralbl. Gesammte Forstwesen. Hempel., 1878: 29.

Braun, A. ——— Monatsber. Akad. Berlin, 1861: 691.

Campbell, J. T. Track of a cyclone which passed over western Indiana more than three hundred years ago. Am. Nat., *20:* 348–353. Jan., 1886.

Caspary, R. Ueber die Veränderungen der Richtung der Aste holziger Gewächse bewirkt durch niedrige Wärmegrade. ———.

——— Beschädigung der Rosskastanien Blätter durch Reibung mittelst Wind. Bot. Zeit., *27:* 201–207. 1869.

Chappelsmith, J. Account of a tornado near New Harmony, Ind., April 30, 1852, with a map of the track, etc. Smithson. Contrib., *7.* 1853.

Darwin, C. Journal of researches into the natural history and geology of the countries visited during the voyages of H. M. S. Beagle round the world, p. 3. London, 1845.

Divers, W. H., and others. The gale of October 14. Gard. Chron., n. s., *16:* 535. 1881.

Eisen, G. Forms of trees as determined by climatic influences. Zoe, *3:* 1–11. 1892. Gard. and Forest, *5:* 322, 334. 1892.

Finley, J. B. Something about tornadoes. Science, *13:* 83, 105.

Fisher, W. R. Forest protection. Schlich's Manual of Forestry, *4:* 455.

Frank, B. Die Pflanzenkrankheiten. A. Schenk, Handbuch der Botanik, *1:* 468–470.

Goebel, K. Die Vegetation der Venezolanischen Paramos. Pflanzenbiologische Schilderungen, *2:* 1–160. Marburg, 1891.

Haberlandt, G. Das Mechanische System. Physiologische Pflanzenanatomie, 134–180. Leipzig, 1896.

Hough, F. B. Report upon forestry prepared under the direction of the commissioner of agriculture in pursuance of an act of congress approved August 15, 1876. 1877: 56; 1878–'79: 67. Washington.

Houston, E. J. Outlines of forestry, p. 66. Philadelphia, 1893.

Hoyt, B. F. The wind and the tree tops. Am. Nat., *20:* 1051–1052. 1886.

Jungner, J. R. Klima und Blatt in der Regio Alpina. Flora, *79:* 219–284. 1894.

——— Anpassungen der Pflanzen an des Klima in den Gegenden der regenreichen Kamerungebirge. Bot. Centralb., *47:* 353–360. 1891.

Kerner, A. Die Schutzmittel des pollens gegen die Nachtheile vorzeitiger Dislocation und gegen die Nachtheile vorzeitiger Befruchtung. Innsbruck, 1893.

Kerr, W. C. Storms of August 24 and 29. Proc. Nat. Sci. Assoc. Staten Island, *3:* 48–51. Sept., 1893. Science, *22:* 155. 1893.

——— Survival of storm-injured leaves. Proc. Nat. Sci. Assoc. Staten Island, *4:* 32. Dec., 1894.

——— Notes on the destructiveness of wind and rain in storms. Proc. Nat. Sci. Asso. Staten Island, *4:* 64–66. Mar., 1895.

Kihlman, A. O. Pflanzenbiologische Reise nach Russisch-Lappland. Acta Soc. pro Fauna et Flora Fennica, *6.* 1890.

Kjellman, F. R. Ur polarnäxternas lif. Nordenskiöld, Studier och Forsaningar, 1884: 474.

Klinge, J. Ueber den Einfluss der mittleren Windrichtung auf das Verwachsen der Gewässer nebst Betrachtung anderen von der Windrichtung abhängiger Vegetations-erscheinungen im Oostbalticum. Engler's Bot. Jahrb., *11:* 264–313. 1890.

Knight, T. A. On the causes which influence the direction of the growth of roots. Phil. Trans. R. Soc. London, 1811: 209–219. Nicholson Journ., *30:* 370–378. 1812.

——— Account of some experiments on the descent of the sap in trees. Phil. Trans. R. Soc. London, 1803: 277–289. Journ. R. Inst. Great Britain, 1803: 71–74.

Kny, L. Ueber die Anpassung der Laubblätter an die mechanischen Wirkung des Regens und Hagels. Ber. deutsch. bot. Ges., *3:* 207–213. 1885.

Kuntze, O. Schutzmittel der Pflanzen gegen Thiere und Wetterungunst und die Frage vom Salzfreien Urmeer. Gratis Beilage zur Bot. Zeit. Leipzig, 1877.

Lapham, I. A. [A report on windfalls in Wisconsin.] 1870–72.

Ludwig, F. Lehrbuch der Biologie der Pflanzen, p. 205. Stuttgart, 1895.

Magnus, P. Beschädigung der Blätter durch Sturm. Verhandl. bot. Ver. Brandenb., *18:* viii–xi. 1876.

Massart, J. La biologie de la vegetation sur le littoræ Belge. Bull. Soc. Bot. Belge, *32:* 7–43. 1893.

Maury, M. F. Influence of wind on plants. Western Journal and Civilian, *4:* 315.

Miall, L. C. Round the Year, a series of short nature studies. London, 1896.

Middendorff, A. von. Die Gewächse Sibiriens. Sibirische Reise, *4*[1]: 525–783. St. Petersburg, 1864.

Mohr, C. Timber pines of the southern United States. U. S. Dept. Agr., Div. Forestry, Bull. 13. 1896.

New York. Annual report of the forest commission for the year 1893, *1:* 251, 328.

Nicholson, G. Wind. Illustrated dictionary of gardening, *4:* 211. London.

Norton, J. B. S. The effects of wind on trees. Gard. & Forest, *10:* 292. Cf. also Bot. Gaz., *24:* 142. 1897.

Pammel, L. H. Wind-storms and trees. Science, *19:* 205. 1892.

Parsons, G. H. The climate of Colorado and its effect on trees. U. S. Dept. Agr., Div. Forestry, Bull. 2: 230–232.

Plumbly, G. The late stormy weather. [Feb. 27–28.] Gard. Chron., Mar., 1860.

Rees, A. Wind, qualities and effects of. Cyclopedia of arts, sciences, and literature, *38.* London, 1819.

Rossmassler, E. A. Der Wald, 3 ed., 118, 252, 255, 324. Leipzig, 1881.

Saint Louis. Report of Board of Commissioners of Tower Grove Park, 1896: 7–8.

Sargent, C. S. The hot winds of the prairies. Gard. & Forest, *8:* 331. 1895.

Schacht, H. Der Baum, p. 334. Berlin, 1853.

Schrenk, H. von. The trees of St. Louis as influenced by the tornado of 1896. Contributions from Shaw School of Bot., 10. Trans. Acad. Sci. St. Louis, *8:* 25–41. 1897.

Schwarz, F. Forstliche Botanik, p. 180. Berlin, 1892.

Sickels, J. Exercises in wood working, p. 28; *f. 14.* New York, 1889.

Stahl. Regenfall und Blattgestalt. Ann. Jard. bot. Buitenzorg, *11:* 98–182; *t. 10–12.* 1893.

Tschirch, A. Das mechanische System. Angewandte Pflanzenanatomie, 285. Wien und Leipzig, 1889.

Warming, E. Lehrbuch der ökologischen Pflanzengeographie, p. 36–41. Berlin, 1896.